

Table I. Weight of Earth and Space Grown *Zea mays* seedlings

Tissue	Fresh weight per seedling (grams) mean \pm SE (n)		Statistics		
	Earth	Space	t*	deg freedom	P**
Shoot	0.351 \pm 0.017 (16)	0.390 \pm 0.019 (8)	-1.377	22	0.182
Root	0.103 \pm 0.003 (16)	0.105 \pm 0.007 (8)	-0.413	22	0.684
Kernel	0.411 \pm 0.008 (16)	0.435 \pm 0.006 (8)	-1.917	22	0.068

*Student's t test

**Observed level of significance for positive or negative differences between earth and space samples

Table II. Weight of Earth and Space Grown *Zea mays* seedlings

Tissue	Dry weight per seedling (mg) mean \pm SE (n)		Statistics		
	Earth	Space	t*	deg freedom	P**
Shoot	8.70 \pm 0.479 (16)	9.99 \pm 0.572 (8)	-1.627	22	0.118
Root	3.61 \pm 0.156 (16)	3.75 \pm 0.354 (8)	-0.417	22	0.681
Kernel	62.4 \pm 2.99 (16)	61.8 \pm 3.33 (8)	0.135	22	0.893

*Student's t test

**Observed level of significance for positive or negative differences between earth and space samples

Table III. Dry Weight as Percent of Fresh Weight

Tissue	Dry weight/fresh weight \pm SE (n)		Statistics		
	Earth	Space	t*	deg freedom	P**
Shoot	0.0247 \pm 0.0005 (16)	0.0256 \pm 0.0005 (8)	-1.02	22	0.24
Root	0.0350 \pm 0.0008 (16)	0.0352 \pm 0.0013 (8)	-0.14	22	0.89
Kernel	0.151 \pm 0.0051 (16)	0.142 \pm 0.0073 (8)	1.03	22	0.32

*Student's t test

**Observed level of significance for positive or negative differences between earth and space samples

Table IV. Free Indole-3-Acetic Acid Content of Earth and Space-Grown *Zea mays* Seedlings

Tissue	pmol•plant ⁻¹ mean ± SE (n)		Statistics		
	Earth	Space	t*	deg freedom	P**
Shoot	34.8 ± 5.21 (11)	29.9 ± 2.82 (8)	0.75	17	0.46
Root	26.4 ± 2.46 (11)	17.7 ± 1.82 (5)	2.22	14	0.043
Kernel	644 ± 81.6 (11)	391 ± 66.3 (6)	2.08	15	0.055

*Student's t test

**Observed level of significance for positive or negative differences between earth and space samples

Table V. Total Indole-3-Acetic Acid Content of Earth and Space-Grown *Zea mays* Seedlings

Tissue	pmol•plant ⁻¹ mean \pm SE (n)		Statistics		
	Earth	Space	t*	deg freedom	P**
Shoot	393 \pm 31.3 (15)	309 \pm 15.4 (7)	1.78	20	0.09
Root	144 \pm 9.48 (12)	167 \pm 34.3 (6)	0.85	16	0.41
Kernel	64,361 \pm 2,791 (13)	70,645 \pm 1,538 (8)	1.61	19	0.12

*Student's t test

**Observed level of significance for positive or negative differences between earth and space samples

Table VI. Free Absciscic Acid Content of Earth and Space-Grown *Zea mays* Seedlings

Tissue	pmol•plant ⁻¹ mean ± SE (n)		Statistics		
	Earth	Space	t*	deg freedom	P**
Shoot	20.4 ± 0.789 (16)	20.8 ± 0.695 (8)	0.37	22	0.72
Root	10.9 ± 0.277 (16)	11.5 ± 0.251 (8)	1.36	22	0.186
Kernel	9.81 ± 0.117 (15)	10.4 ± 0.134 (8)	3.07	21	0.006

*Student's t test

**Observed level of significance for positive or negative differences between earth and space samples

Table VII. Total Absciscic Acid Content of Earth and Space-Grown *Zea mays* Seedlings

Tissue	pmol•plant ⁻¹ mean ± SE (n)		Statistics		
	Earth	Space	t*	deg freedom	P**
Shoot	37.0 ± 0.868 (16)	37.1 ± 1.10 (8)	0.07	22	0.941
Root	21.1 ± 0.675 (16)	21.8 ± 0.519 (8)	0.65	22	0.523
Kernel	41.3 ± 0.662 (15)	43.3 ± 0.672 (8)	1.89	21	0.072

*Student's t test

**Observed level of significance for positive or negative differences between earth and space samples

Legends for Figures

Fig. 1. A photograph of the canisters used for the germination and growth of the seedlings of Zea mays. The canisters were constructed of anodized aluminum and consist of two cans threaded together, to make a total assemblage 355 mm tall. There are 4 light-baffled holes in both the lower and upper can of the canister providing gas exchange for the plants. For both flight and earth controls, the canisters were encased in plastic foam and placed in a mid-deck locker of the orbiter or a simulation of the locker. An ambient temperature recorder (ATR) was placed in the foam to record temperatures during the experiment.

Fig. 2. The temperature in the mid-deck locker at a point proximal to the canisters during the flight of Atlantis, STS-34, is shown by the dashed line. The initial temperature of 25°C was that of Hanger L where the canisters were prepared for launch. The drop in temperature to 20°C was owing to early morning outdoor temperature as the lockers were taken to the launch pad. A slow rise in temperature to 29°C occurred throughout the remainder of the flight.

The temperature at a point proximal to the canisters during the temperature simulated control at MSU is shown by the broken line. Owing to the lag between air temperature and that recorded by the thermister probe it was necessary to off-set the start of the experiment by 191 minutes to better simulate flight temperature in the canister.

Fig. 3. A recording of ion current versus retention time for the ions $m+=189$ and 195 , the molecular ion for methyl IAA and $^{13}\text{C}_6$ -methyl IAA, and $m/z=130$ and 136 for the quinolinium ion derived from IAA and $^{13}\text{C}_6$ -IAA. The absence of contaminant peaks having these masses is shown. This together with the agreement in ratio of $195/189$ as compared to $136/130$ establishes the purity and identity of the compounds measured.

Fig. 4. A representative control seedling grown in the laboratory under conditions as nearly identical as possible to seedlings grown in space. Orientation of root and shoot growth is normal.

Fig. 5. A representative seedling grown in space at a chronic g force of $10^{-6} g$. About one-half of the seedlings exhibited this disorientated growth often with a kink as shown in the figure or with root and shoot growing parallel to each other.

Fig. 1

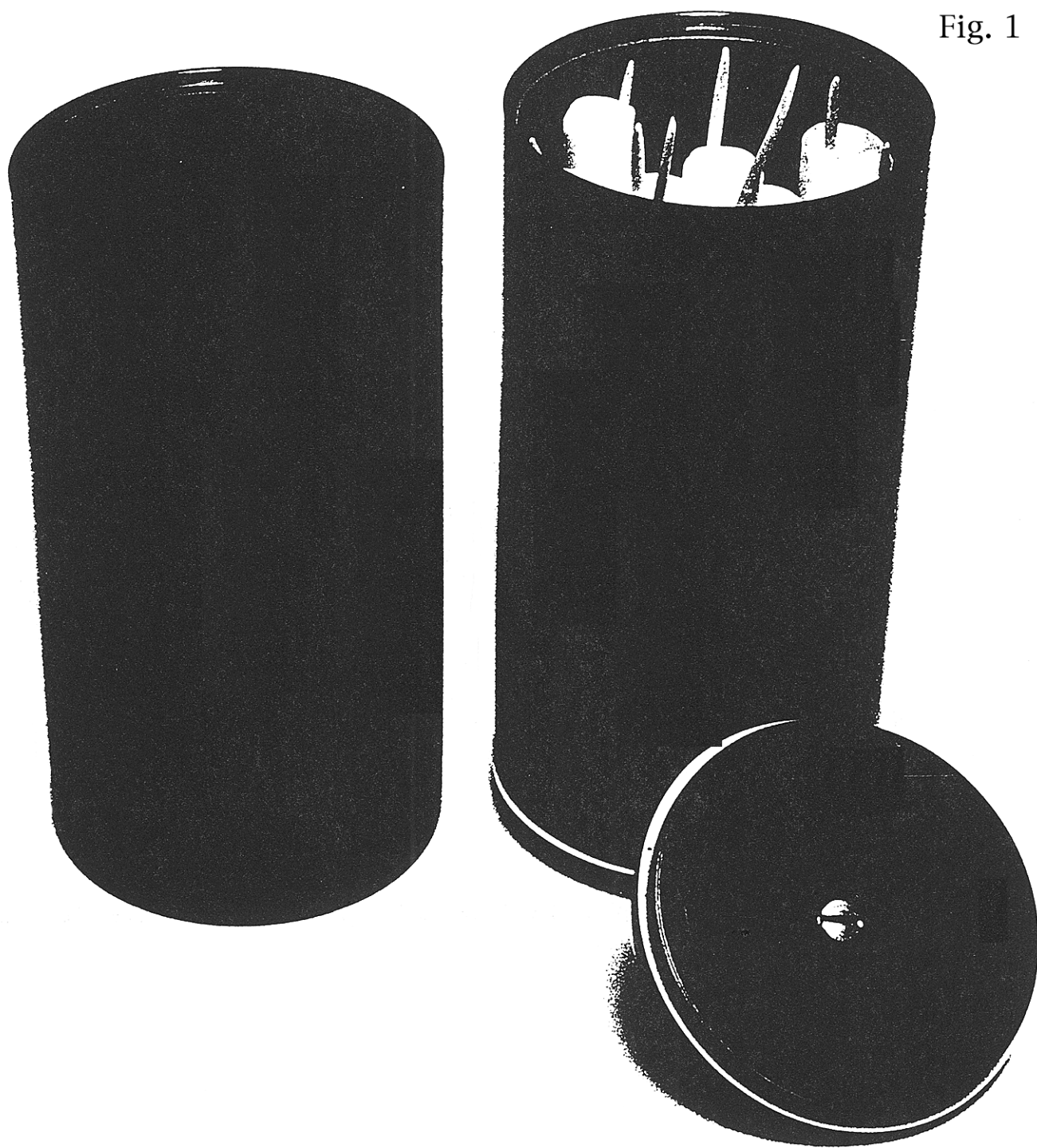


Fig. 2

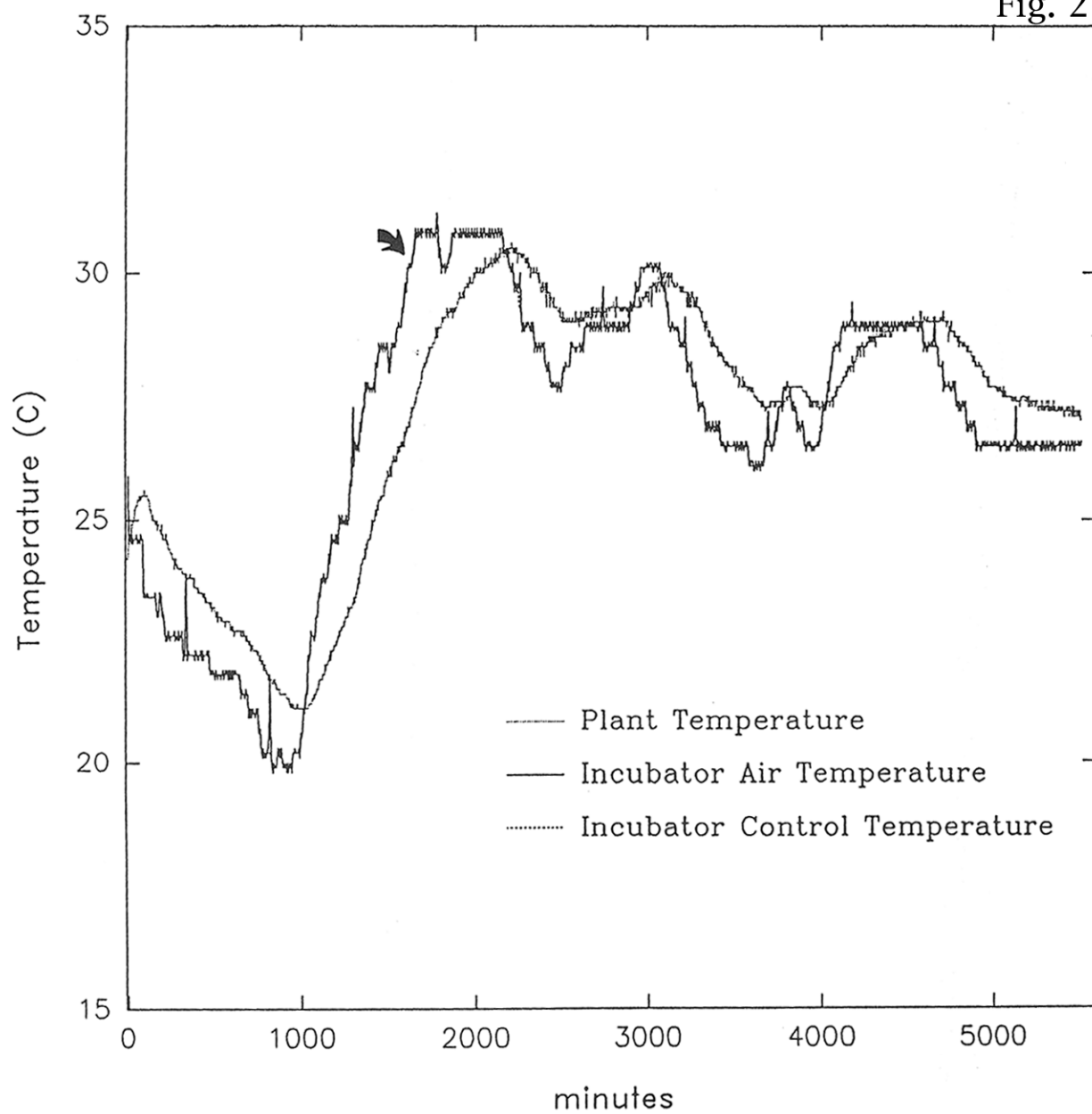
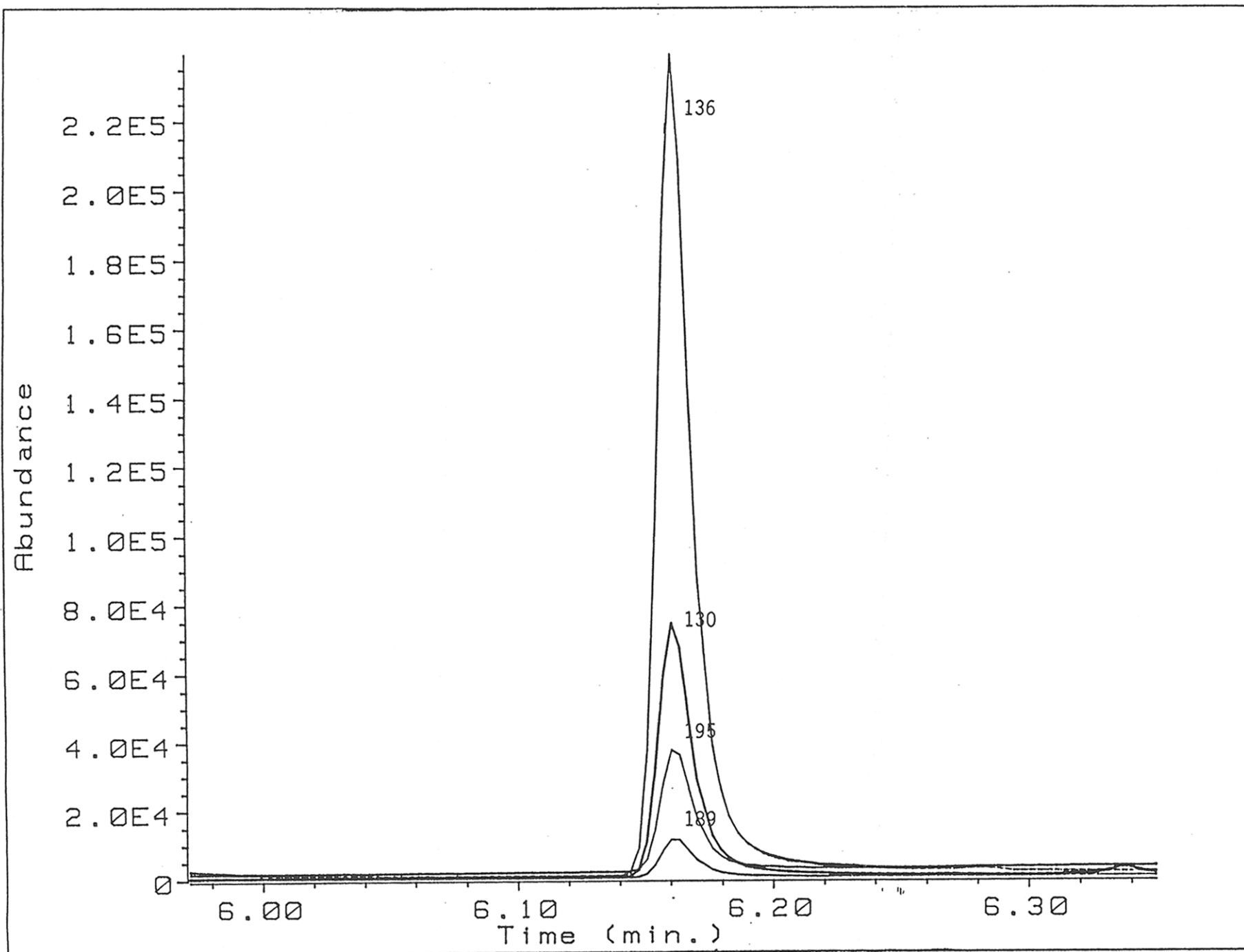


Fig. 3



EXTRACTED ION PROFILE OF A METHYLATED IAA PLANT SAMPLE SHOWING THE MOLECULAR IONS AND BASE IONS OF THE SAMPLE + ^{13}C INTERNAL STANDARD.

Fig. 4

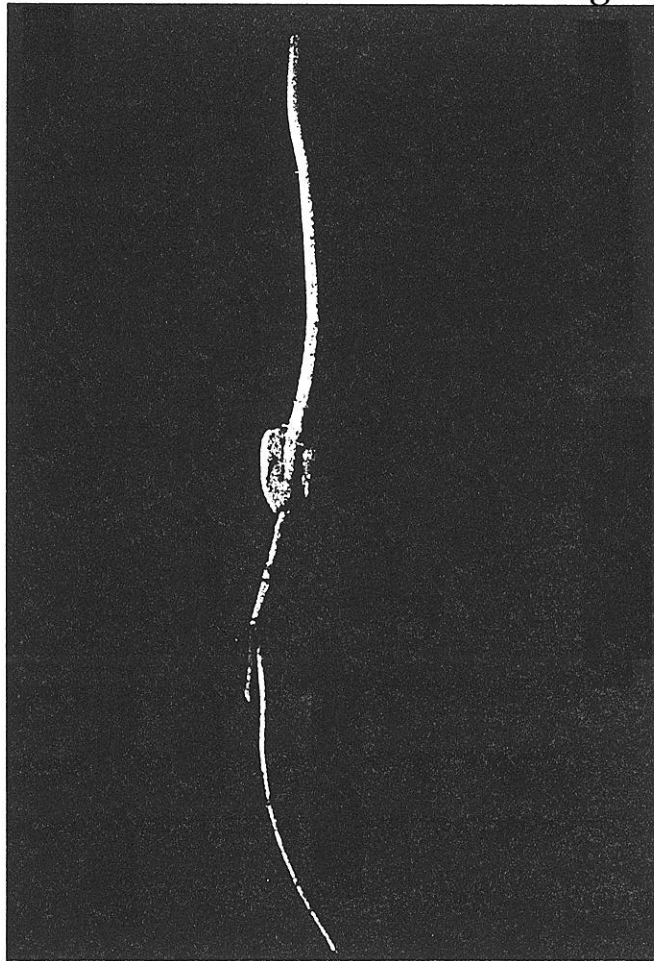


Fig. 5

